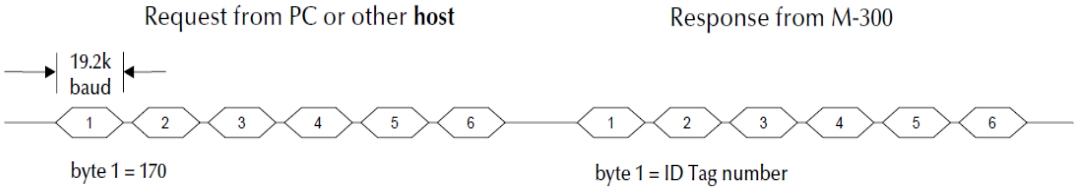
KUS550 Series Ultrasonic Sensor MODBUS Protocol（version V2.8）

Version	Record	Date
V1.0	Public	2014.8.7
V2.4	Modify the register address and add some FAQs	2020.9.1
V2.6	Modify the register map	2021.10.08

1.Communications Protocol

The data rate defaults to 19.2 K baud. Each byte contains 10 bits that include a start bit, 8-bit data, and1 stop bit and no parity bit. There is a total of 6 bytes required to access the KUS550. The KUS550 will respond back with 6 bytes that include status (range to target, temperature, target strength, etc), Data Memory read requests, and sensor error messages on the RS-485 bus. Transmitted values are in binary.



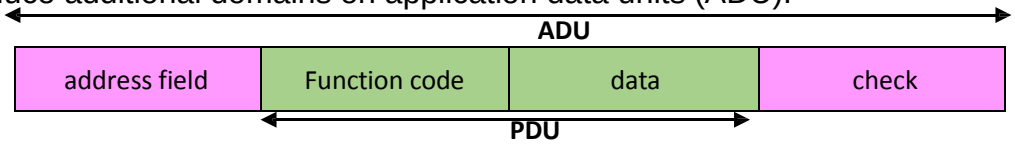
2. Sensor Commands

Each command has a total of 6（or 8）bytes, and all sensor commands are sent and displays by HEX. The sensor ID Tag uses 01 as an example

2.1 Modbus Commands

2.1.1 Protocol description

MODBUS protocol defines a simple protocol data unit (PDU) independent of the underlying communication layer. On a particular bus or network MODBUS protocol mapping can introduce additional domains on application data units (ADU).



Clients that initiate MODBUS transaction processing create MODBUS application data units. The function code indicates to the server where to execute Kind of operation.

2.1.2 Modbus Message Framing

1）Request command

Sensor ID	Function code	Data address	Data length	Check sum(CRC16)
1 byte	1byte	2 byte	2 byte	2 byte

Supported function code:

(1) Read Holding Register (03)

(2) Preset Single Register (06)

Example for Read Holding Register (03).

Command is 01 03 00 00 00 01 84 0A for reading 00 register length = 1

01 03 01 00 00 03 04 37 for reading status info(0x100) and distance(0x101) and temperature(0x102)

Command is 01 03 01 01 00 02 94 37 for reading distance and temperature
Command is 01 03 01 01 00 01 D4 36 for reading distance(0x101)

2）Response

Sensor ID	Function code	Data length	Data	Check sum(CRC16)
1 byte	1byte	1 byte	(Data length)*2 byte	2 byte

Example: Tx: 01 03 00 0D 00 01 15 C9
Response is Rx:01 03 02 06 01 7A 24 (The contents of register 0D are 0601)

Tx:01 03 00 00 00 0A C5 CD

Rx:01 03 14 06 01 00 00 0E 01 13 A5 00 01 07 D0 00 00 00 00 03 FF 19 16 5F 27

Tx:01 03 01 00 00 03 04 37

Rx:01 03 06 00 08 18 6D 00 0A D7 CE

Tx:01 03 01 01 00 02 94 37

Rx:01 03 04 18 78 00 0B 3D 4D

Tx:01 03 01 01 00 01 D4 36

Rx:01 03 02 18 6A 32 6B

Example for Preset Single Register (06)

As the physical register is 8bits width and the 2 bytes wrote or read by the modus protocol, so the physical register is joint together, if the address n register should be wrote, the acceptable operation is read the address n and get the value of registers n and n+1, keep the register n+1 still and modify the register n, write the value of register n and n+1 back.

A), Change the baud rate to 38400bps.

Step1: Read the register 0x00

Tx:01 03 00 00 00 01 84 0A

Rx:01 03 02 06 01 7A 24

Step2: write 0x0701 to 0x00and 0x01; address

Tx:01 06 00 00 07 01 4A 3A

Rx:01 06 00 00 07 01 4A 3A

Setp3: write 0x00 to address 0x100 to reboot the sensor

Tx:01 06 01 00 00 00 88 36

Rx:01 06 01 00 00 00 88 36

Step4: Change the host baud rate to 38400bps and reconnect

2.2 Normal operation for the sensor

Below is some normal operation of the sensor. Such as change the distance sensor working as level sensor, change the measure result unit, change the measure period, change the baud rate. you can send and receive the command and echo by uart tools such as the sscom. And also you can use the Modbus Poll. You can download the file in the website www.kacise.com.

2.2.1), Reboot the sensor

Write to the register 0x100 any value to reset the sensor.

Step1: write 0x00 to the register 0x100 to reset the sensor.

Tx:01 06 01 00 00 00 88 36
Rx:01 06 01 00 00 00 88 36

2.2.2), Change the slave sensor ID

Step1: inquiry the sensor ID the default is 0x01

Tx: 01 03 00 15 00 01 95 CE
Rx: 01 03 02 00 01 79 84 the lower 8 bits is the sensor ID.

Step2: change the ID to 2,

Tx: 01 06 00 15 03 02 19 3F write 0x0302 to 0x15 register the address is 0x2A for the former software version V2.4
Rx: 01 06 00 15 03 02 19 3F Succeed

Step3: Active the new ID by reboot the sensor by reset the sensor.

Tx:01 06 01 00 00 00 88 36
Rx:01 06 01 00 00 00 88 36

2.2.3), Change the measure type from distance mode to liquid level mode.

Step1: read the measure result type register

Tx: 01 03 00 23 00 01 75 C0 inquiry 0x23 register, the High 8 bits is the measure type register ==0 the measure result is distance ==1 the measure result is level.
Rx: 01 03 02 00 00 B8 44 inquiry result of the register 0x23, the upper 8 bits is 0x00 by which indicate the measure result is distance.

Step2: set the tank depth (the depth is 20000mm)

Tx: 01 06 00 25 4E 20 AC 79 set register 0x25 is 0x4e20, 0x4e20 is 20000 (dec). the unit is 0.1mm in decimal that means 2000mm
Rx: 01 06 00 25 4E 20 AC 79 setting success, the result. Is 0x4e20.

Step3: change the measure result type

Tx: 01 06 00 23 01 00 79 90 set the register0x23 0x0100,(keep the lower byte as 0x00) to set measure result as level.
Rx: 01 06 00 23 01 00 79 90 the result. Is 0x0100.

Step4: Reboot to active the settings.

Tx:01 06 01 00 00 00 88 36
Rx:01 06 01 00 00 00 88 36

2.2.4), Change the measure type as distance.

Step1: read the measure type register

Tx: 01 03 00 23 00 01 75 C0 inquiry 0x23, the upper 8 bit is the measure type register, =0 the measure result is distance =1 the measure result is level.
Rx: 01 03 02 01 00 B9 D4 inquiry result, the 0x23 is 0x0100, the upper 8 bits 0x01 indicates the measure result is level.

Step2: change the measure result type to distance

Tx: 01 06 00 23 00 00 78 00 set the upper 8 bits of the register 0x23 as 0x00 and keep the lower 8 bits still to set measure result as distance.
Rx: 01 06 00 23 00 00 78 00 the result. is 0x0000.

Step4: Reboot to active the settings.

Tx:01 06 01 00 00 00 88 36
Rx:01 06 01 00 00 00 88 36

2.2.5), Inquiry the slave address (ID) of the sensor *

This operation is used when the sensor ID is unknown. The method is sending broadcasting command to read the 0x15 register for the slave address

Tx: 00 03 00 15 00 01 94 1F send the broadcasting inquiry to get the slave address.
Rx:01 03 02 01 00 B9 D4 Get the salve address (ID) is 0x01.

**:The memory address of slave address(ID) is 0x28 if the software version is less than V2.4 the slave ID address is 0x15 in the version V2.6*

2.2.6), Modify the measure period.

The default measure result is 5Hz, that means the period of measure is 200ms, the 1 LSB is 25ms,

Step1 inquiry the period registers 0x50 and 0x51.

Tx: 01 03 00 50 00 02 C4 1A Inquiry the 0x50 and 0x51 registers.

Rx: 01 03 04 00 00 08 FF BD B3 the result is 0x000008, is the period parameter, the period is 8*25ms=200ms

Step2 set the new period number to 0x000009 to modify the period to 225ms

Tx: 01 06 00 51 09 FF 9E 0B set the register 0x51 to 0x09FF.

Rx: 01 06 00 51 09 FF 9E 0B. The result is 0x09ff.

Step3: Reboot to active the settings.

Tx:01 06 01 00 00 00 88 36

Rx:01 06 01 00 00 00 88 36

2.2.7), Modify UART Baud rate as you want

Look up the appendix table for the register 0 and get the right baud rate settings. The default baud rate is 19200bps, the parameter is 6, for example change the baud rate from 19200 to 57600, should change the register 0 from 6 to 8.

Step1: inquiry the 0x00 and 0x01 register value,

Tx:01 03 00 00 00 01 84 0A inquiry the 0x00 register

Rx:01 03 02 06 01 7A 24 get the value 0x0001

Step2: set the register 0x00 to 8 and leave register 0x01 alone.

Tx:01 06 00 00 08 01 4F CA write 0x0801 (keep the lower 8 bits unchanged)

Rx:01 06 00 00 08 01 4F CA

Step3: Reboot to active the settings.

Tx:01 06 01 00 00 00 88 36

Rx:01 06 01 00 00 00 88 36

Step4: modify the host baud rate to the same57600. Change the host port to the matched baud rate connect again.

2.2.8), Change the analog output as switch output

The analog output can work in switch output mode, look up the register catalogue, 0x23(35) register define analog output type =0x00 voltage output in liner mode, =0x01, Voltage Output as switch， there are 2 the switch set points, switch near set point called A1 and switch Far Set point called A2. The output changes according the distance or level. We take below as a result to demonstrate the setting method.

The user wants define the output 0v when the distance less than A1(500mm), and output 10V when the distance between A1(500mm) and A2(2000mm), and 0V the distance more than A2(2000mm).

If the analogue output is 4-20mA, the0v and 10v will be 4mA and 20mA instead,

Step1: Inquiry and set A1 as 500mm, (write 5000 (0x1388) to 23 register)

Tx: 01 03 00 24 00 01 C4 01 read the register value in 0x24

Rx: 01 03 02 07 D0 BB E8

Tx: 01 06 00 24 13 88 C4 97 Write 0x1388 in the register 0x24

Rx: 01 06 00 24 13 88 C4 97

Step2: Inquiry and set A2 as 2000mm, (write 20000(0x4E20) to 0x25 register)

Tx: 01 03 00 25 00 01 95 C1

Rx: 01 03 02 61 A8 90 6A

Tx: 01 06 00 25 4E 20 AC 79

Rx: 01 06 00 25 4E 20 AC 79

Step3: inquiry the Switch Mode Output Operation register(0x2C), and write 0x05 into

it.

Tx: 01 03 00 2C 00 02 05 C2
Rx: 01 03 02 12 FF F4 A4
Tx: 01 06 00 2C 05 FF 0B 13
Rx: 01 06 00 2C 05 FF 0B 13

Step4: Inquiry and Set the output as switch out (write 0x01 into 0x23(35) register)

Tx: 01 03 00 23 00 01 75 C0 inquiry the 0x23(35) registers.
Rx: 01 03 02 01 00 B9 D4
Tx 01 06 00 23 00 01 98 54 set 0x23 register as 0x0001(keep the upper 8 bits unchanged, as the upper 8 bits define the measure result is level or distance)
Rx01 06 00 23 00 01 98 54

Step5: Reboot to active the settings.

Tx:01 06 01 00 00 00 88 36
Rx:01 06 01 00 00 00 88 36

2.2.9), How to change the range

The product range can be modified according to the demand. However, please note that the modified range should not exceed the maximum measurement range of this product, and should not be less than the measurement blind area of this product.

Address 24 and address 25 represent the minimum distance and maximum distance(unit:0.1mm) respectively (The analog output is modified by 0x24 and 0x25, and the switching output is modified by 0x28and 0x29). Here, the modified range of 4-20mA product is introduced as an example. For example, modify the detection range to 2000-10000(unit:0.1mm):

Step1: modify the register of 0x24 to 2000 and modify the register of 0x28 to 2000;
Step2: modify the register of 0x25 to 10000 and modify the register of 0x29 to 10000;
Step3: send reset instruction 0x256 address, click OK.

And there is an example:

The original range is 2000-30000(unit:0.1mm) product, the customer requires to change the range to 2000-6000(unit:0.1mm) and 3000-7000(unit:0.1mm), and the specified steps are as follow:

Change range to 2000-6000(unit:0.1mm) for liner output

Step1: change 0x24 register value to 2000
Tx: 01 06 00 24 07 D0 CA 6D
Rx:01 06 00 24 07 D0 CA 6D
Step2: change 0x25 register value to 10000
Tx: 01 06 00 25 27 10 82 3D
Rx: 01 06 00 25 27 10 82 3D
Step3: Check and modify the analogue output as liner type
Tx:01 03 00 23 00 01 75 C0 inquiry the 0x23 to check the lower 8 bits value. Make sure it's 0x00.
Rx:01 03 02 00 00 B8 44
Step4: reset the sensor
Tx:01 06 01 00 17 70 86 22 reset
Rx:01 06 01 00 17 70 86 22

Change range to 3000-7000(unit:0.1mm) for switch output:

Step1: change 0x28 address to 3000
Tx: 01 06 00 28 0B B8 0E 80
Rx: 01 06 00 28 0B B8 0E 80
Step2: change 0x29 address to 7000

Tx: 01 06 00 29 1B 58 53 08
Rx: 01 06 00 29 1B 58 53 08

Step3: set the analogue output as switch

Tx:01 03 00 23 00 01 75 C0 Read and check the analogue output type
Rx:01 03 02 00 00 B8 44 find the analogue output parameter is 0x0000, should be changed to 0x0001.
Tx:01 06 00 23 00 01 B9 C0 Modify the analogue output to switch.
Rx:01 06 00 23 00 01 B9 C0

Step4: reboot

Tx:01 06 01 00 1B 58 83 3C reboot
Rx:01 06 01 00 1B 58 83 3C

2.2.10) How to modify the measuring period

In the actual measurement process, the customer may need to modify the measurement period. The default detection period of our product is 200 ms, (the default register value is 0x000008, and 1lsb=25ms). Of course, the customer can modify the measurement time according to his actual situation. There measurement period defined by a 24-bit register, which is a combo by the registers 0x51, and 0x52. So the maxim period is 0xFFFFFF*25ms= 419430 seconds and the minimum period is 0 ms (The register value is 0 and the real period is around 15ms).

Here is an example of how to make a measurement every 5 minutes.

If we want to modify the period to 5 minutes, the register value can be calculated by:

5*60 *1000 /25= 12000 (0x002EE0), so set the value 0x002E to 0x50register and write 0xE0FF to the 0x51 register. The modification as follows:

Step1: Write 0x002E to 0x50 register

Tx: 01 06 00 50 00 2E 09 C7
Rx: 01 06 00 50 00 2E 09 C7 Modified measurement time (5 minutes)

Step2: reboot

Tx:01 06 01 00 2E E0 94 1E
Rx:01 06 01 00 2E E0 94 1E reset

And there is a rule should concern here, as the average window is minimizing the error of measurement by make average for the last several measure results. if the measurement period goes too long, the average will make no sense. This example is a requirement actually proposed by the customer. We have modified the period and changed the default average window size of the software from 2 to 4. Customer request once every 5 minutes output measurements, if the average output, then the last output will be the average of several measurements, because the customer measure requirement, the liquid level is continuously produce small changes, so with the increase of time, the change of liquid level will be more and more big, the last time this will lead to the average output of produce error, so we should make each output a single test value.

3. working in the low power mode

There are 4 kinds of working mode,

3.1: Ultrasound normal measuring mode

The KUS series ultra-low power consumption ultrasound waterproof sensor will keep measuring for a determined period, the default period is 200ms, and the smallest period is around 25ms. The KUS series ultra-low power consumption ultrasound waterproof sensor will keep transmitting the ultrasound to measure the distance. this mode is usually used to measure when the application field need quick response for the distance change. Or during the system adjustment and match. also the limitation of this mode is only 1 sensor for one place and direction, on the same RS485 bus.

3.2: ultrasonic standby measuring mode

The sensor will standby till the distance inquiry command sent from the host. The same to say, we can control the senor when and how to transmit ultrasound to measure, so it is very useful when there are more than 2 sensors in a limited space to measure the different direction and position. It's very easy to use during this kind of application field, it's acceptable for 254 sensors in one RS485 bus with the different address 0x01-0x254.

3.3: Sleep and waken able for measuring mode

This is the lowest power consumption mode, the sensor will be sleep after power on, the sensor will be wakened up when there is high to low or low to high change on the RXD pin of the sensor, and the sensor will receive the UART frame to process. If the command is distance inquiry command the sensor will trigger a measuring and response to the host and then go to sleep. The sensor will keep wakened around 10ms, so the host must send 2 parts signals to the senor, lead code and then the Modbus-RTU command in 10 ms.

So, there are some methods to save power as follows, if just consider the software configuration.

1 modify the measure period to as long as the customer can accept by modify the register 0x50 and 0x51.

2 the KUS550L and KUS600L is Low power consumption product.

First the KUS550L and KUS600L are low power consumption type product, which just have RS485 or TTL UART output signals.

There is some little different for the protocol of KUS550L and KUS600 comparing with other related product such as KUS500.and KUS3000.

The sensor first will be set working in mode 2, by which the sensor will sleep after measure each time.

3.4 auto update mode

This is the a easy to use mode, the sensor will update the measure result automatically, when the sensor finished measurement once. And the period defined by the register measure Period (0x32 and 0x33). This mode is usually used by some IOT solution integrators. Because this is very easy to control by the software engineer, each time the RTU power on the sensor and power down it when the RTU get the stable result. the interval time can be controlled to 3 seconds to finish the measurement and get the stable result.

And beware of this mode is not match the ModBus protocol exactly.

4 FAQ

Question 1: What can I do, if I cannot connect to the sensor by RS485.

If the user cannot get any echo from sensor UART, there may be something wrong, pls check as below.

Step 1, Check the sensor if it's working, by listen the sound of the probe.

If you can listen the click sound when you go near the sensor around several centimeters, the means the sensor is working well. Else you can also check the power consumption, the current is around 10mA-20mA, if the current goes too high or too low, maybe there is something wrong with the sensor please contact KACISE for more support. Or if the product is 550L or 600, the sleep mode power consumption is less than 0.2mA, it's normal. The 550L 600 usually is set to mod0 before delivered, except was asked by customer set to mode 2.

Step 2, Check if the slave ID (slave address) is matched with the host command.

The sensor doesn't react to the command which with the wrong slave ID (slave address), unless the slave ID is the broadcasting address,0x00. So, the user can send the

broadcasting hexadecimal string00 03 00 15 00 01 94 1F to the sensor, the sensor will echo to the host with the right slave address (ID). Note, we don't think is wise to use the broadcasting address 0x00 when the sensor working in RS485 the bus, because it there will be the bus conflict occurred.

Step 3, Check the UART baud rate.

The sensor can only accept the command on condition of the baud rate is match well. the default UART baud rate is 19200bps unless asked by the customer. The baud rate can be changed by modify the register 0x00 and reboot the sensor. May be the register be changed wrongly, so the sensor has no action to the command. This problem can be solved by try to find the right baud rate by modify the host baud rate and to try if can get a right action from the sensor, so there is a better method by send the hexadecimal string 00 03 00 15 00 01 94 1F to the sensor during trying different baud rate.

The answer will be clear after the three steps finished.

Appendix A: KUS550 Data Memory

Table A-1 KUS550 Data Memory

Addr. Hex (Dec)	**Definition**	**Variable Description**	**Default Value (Hex)**
0x00(0)	Baud Rate upper byte	Values in this location must be between 1 and 9. 1=300bps; 2=600bps; 3=1200 bps; 4=2400bps; 5=4800bps; 5= 9600; 6= 19200; 7=38400; 8= 57600; 9= 115200bps. 9=5600; 10=57600; 11=115200.	0x06xx
0x01(1)	Unit upper byte	0= the measure result unit is 0.1mm Means the measure distance or level range is 0-6553.5mm 1= the measure result unit is 1/128inch Means the measure distance or level range is 0-512inch 2= the measure result unit is 1mm Means the measure distance or level range is 0-65.535meters	0x00XX
0x15(21)	Sensor address upper byte	Values in this location must be between **1** and **253**	0x01
	Lower byte	Reserved for debug	0xxx
0x2F(47)	Trigger Mode upper byte	"0" establishes normal operation or internal self-triggering at a rate programmed by the Sample Rate. "1" in this location places the sensor in a software trigger mode where a computer or other host is required to initiate the sensor to measure and transmit the measure result. It's also called working in the low power consumption mode Other value is reserved.	0x00

	Temperature Compensation indicator (lower byte)	0 = self-temperature compensation ,1 =host writing compensation	0x00

Address Hex (Dec)	Definition	Variable Description	Default Value (Hex)
0x23(35)	Working mode (upper byte)	0: normal working mode, the sensor always measuring and update the measure result, update the analogue output (if the analogue out is hardware selected) the host can get the result by read command. In this mode the address 0x64-0x66 is the definition of ultrasound transmitting interval. 1lst is 25ms.0 means the sensor working without delay. 1: software triggered mode, the sensor will take active and stand by till get the command from the host, then the sensor will emit the ultrasound to measure and send the result back to the host. 2: sleep mode. The sensor will weak up after get a 0x00 on the UART, the week period is around 5ms, during which the host must send the Complete data frame (0xxx 03 01 01 00 01 CRCH CRCL) then the sensor will emit the ultrasound to measure the result and send it back to the host.	0x00
	Voltage Output Operating Mode (lower byte)	This location defines the operating mode of the Sensor's Voltage Output. A "0" in this location operates the Voltage Output in a linear mode. The parameters that control the slope and min/max voltage values of Voltage output are located in data memory locations Zero Set point Distance, Zero Set point Voltage Value, Span Set point Distance, and Span Set point Voltage Value. A "**1**" in this location operates the Voltage Output as switch. The parameters that control the switch points are located in data memory Close Set point Distance, Far Set point Distance, and Switch Mode Output Operation and Set point Output Hysteresis.	0x00
0x24(36)	Zero Set point Distance	This 2-byte memory location represents the distance for the Zero Set point Voltage Value for the voltage output operating in the Linear Mode. The Voltage Output will operate linearly when a target is detected between this Zero Set point Distance and the Span Set point Distance. The limits are the sensors minimum and maximum specified ranges and must not equal the Span Set point Distance.	0xEC04

0x25(37)	Span Set point Distance	This memory location represents the distance for the Span Set point Voltage Value for the voltage output operating in the Linear Mode. The Voltage Output will operate linearly when a target is detected between the Zero Set point Distance and this Span Set point. Distance. it must not equal the Zero set point Distance.	0x5F27
0x26(38)	Zero Set point Voltage Value	This memory location is the voltage value for the Zero Set point Distance and is used when operating in the Linear Mode. The resolution is 1mV/bit	0x00
0x27(39)	Span Set point Voltage Value	This memory location is the voltage value for the Span Set point Distance and is used when operating in the Linear Mode. The resolution f is 1mV/bit. The default is 10,000 (10.25V).	0x2710
0x28(40)	Close Set point Distance	This memory location is the distance used to establish a zone for the Voltage output when operating in the Switch Mode. The 1st set point used to create these zones is the Far Set point Distance. See Switch Mode Output Operation below for details on how the voltage output will operate. The default value is the Sensor's minimum specified distance.	0xEC
0x29 (41)	Far Set point Distance (MSB)	This memory location is the distance used to establish a zone for the Voltage output when operating in the Switch Mode. The 2nd set point used to create these zones is the Close-Set point Distance. See Switch Mode Output Operation below for details on how the voltage output will operate. The default value is the Sensor's maximum specified distance.	0x75
0x2B(43)	Loss of Echo Voltage Value	This value represents the voltage output when the sensor is in the No Echo Condition. The resolution for this 2-byte value is 1mV/bit The default value is 10000(10V).	0x280A

Note 1 the unit of the value is 0.1mm, for example if the value is 0x7530= 30000, that means the far set point is 30000x0.1mm=3000mm.

Addr. Dec. (HEX)	Definition	Variable Description	Default (Hex)
0x2D (45)	Output Hysteresis	The legal hysteresis value is 0-75 means 0%-75%	0x05
	Switch Mode Output definition	This register is used to establish what state of the voltage output when a target is detected within a particular zone created by the Close and Far Set point Distances (subject to Hysteresis, see below) when operating in the Switch Mode. The data byte is parsed as follows: bit 0: define the output when there is No Echo 0: when No Echo Vout=0V; 1: when No Echo Vout=10V. bit 1: define the output status when Target > Far Setpoint Distance the switch output. 0: Vout = 0V;1: Vout = 10V. bit 2*: define the output when Target between Close and Far Setpoint Distances (*bit 3=0 for this function, else see bit 3) 0: Target Present between Close and Far Setpoint Distances, Vout=0V; 1: Target Present between Close and Far Setpoint Distances, Vout=10V. bit 3: define the output when Target between Close and Far Setpoint Distances. 0: See bit 2 for operation of targets between Close and Far Setpoint Distances; 1: No change in voltage output when targets enter between Close and Far Setpoint Distances. (setting this to 1 will disable function of bit 2) bit 4: define the output when Target<Close Setpoint Distance 0: Vout=0V;1: Vout = 10V.	0x05

Register address	Definition	Variable Description	Default Value (Hex)
0x32(50)	Var_measurePeriod(MSB)	The time interval between twice measurement, the value 0x000000 (3-byte-length) means the time is zero, the measurement will begin after the last measurement finished. A lsb means 25ms time gap.	0x00
	Var_measurePeriod(msb)		0x00
0x33(51)	Var_measurePeriod(LSB)		0x08
	Reserved	Reserved	0xFF
0x100(256)	Error and status indicator	Read the note2 for details, write to this register will trigger the sensor reset. **note2**	NULL
0x101(257)	Measure distance	The unit of the measure distance or level will be indicated by bit5and bit4 of the register 0x100.	NULL
0x102(258)	Temperature result	The Unit is degree centigrade 8 bits signed integer the high 8bits always 0s.	NULL

Note 2

Bit15														**Bit0**
Bits	15	14	13 12 11	10	9	8	7	6	5	4	3	2	1	0
Flag	HPER	LPER	RSV	TE	RSV	IERR	C	M T	Unit		Target	Vout	SWT	ERR

Bit0: =1 there is some error occurred.
=0 there is no error occurred.
Bit1: if bit2 =0, this bit is no means, if bit2=1, means the switch status for PNP or NPN output type.
= 0 the switch is off,
= 1 the switch is on,
Bit2 =0 the analogue output is linear.
=1 the analogue output is switch.
Bit3 the echo status report,
= 0 the echo lost,
= 1 the echo received,
Bit5,4 the measure result unit indicator,
= 00 the measure result unit is0.1mm
= 01 the measure result unit is1/128inch

=10 the measure result unit 1mm

=11 RSV

Bit6 the measure result type indicator

= 0 the measure result is distance

= 1 the measure result is level.

bit8 =0 the inner parameters working well

=1 the inner parameters sensor error

Bit10 =0 the inner temperature sensor working well

=1 the inner temperature sensor error

Other bits are reserved for debug.

meausre result for customer V2.6

KUS550 modbus for customer V2.6

sscom5.13.1.rar